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(71) Applicant: SMEDJEBACKEN BOXHOLM STÅL AB [SE/SE]; Box 501, S-777 01 Smedjebacken (SE).

(72) Inventors: SUNDMAN, Bengt ; Oxvägen 14, S-777 00 Smedjebacken (SE). BERGE, Olav ; Bokärrvägen 33, S-430 40 Särö (SE).

(74) Agent: AWAPATENT AB; Box 45086, S-104 30 Stockholm (SE).

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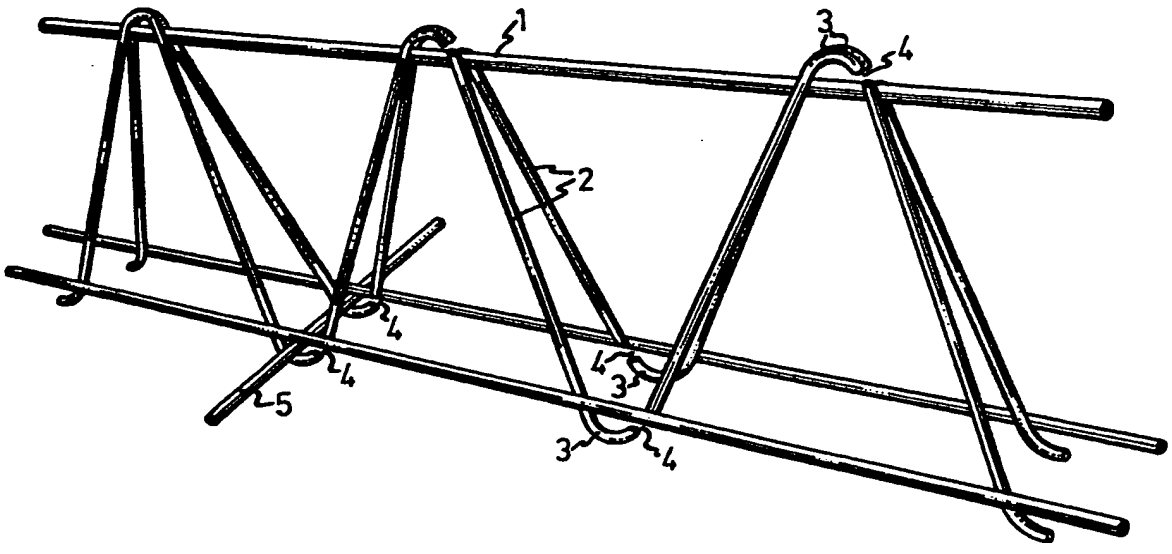

(57) Abstract

The present invention relates to a lattice girder for reinforcing sandwich panels and like structures of concrete, comprising longitudinal wires (1) extending in parallel on different levels, and zigzag wire stirrups (2) interconnecting said longitudinal wires. The invention is characterised in that the wire stirrups (2) extend, at least on one side, beyond the respective longitudinal wire (1) so as to form loops (3) outside the wire. Adjacent the longitudinal wire, the loops are cut open to form grooves (4) into which transverse wires (5) are insertable to connect the lattice girder with other reinforcement units.

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LATTICE GIRDER

The present invention relates to a lattice girder for reinforcing sandwich panels and like structures of concrete, comprising longitudinal wires extending in parallel on different levels, and zigzag wire stirrups interconnecting said longitudinal wires.

The tensile strength of concrete is low as compared to its compressive strength. Hence, where tensile stress occurs in concrete structures, use is frequently made of steel rods to increase the load capacity of the structures.

Tensile stress occurs at many different points in concrete structures, and for a variety of reasons. To achieve the intended function in the structures, certain parts of the reinforcement are frequently embraced by closed stirrups, or different structural parts are joined by means of half-open stirrups. In concrete engineering, different techniques have developed for providing the embracing transverse reinforcement which is so important to the structures, involving the use of e.g. transverse force stirrups, stirrups in the anchor zone, embracing reinforcements in compressed structural members or in the transition zone between the web and flanges in T and I girders or columns.

The embracing stirrups are manufactured from steel rods having the desired size and cross-sectional area, by bending. The stirrups are mounted to embrace the longitudinal rods and are attached thereto by a thin steel wire (tying wire). The purpose of such connection (tying) is to ensure that the reinforcement rods will be correctly positioned in both longitudinal and transverse direction. The so-called reinforcement cage thus formed is frequently manufactured separately from the concrete structure and is then positioned in the form and fixed therein. A characteristic feature of the

tying wire connection is that the wire is not intended to transmit tensile stress in the structure.

In recent years, reinforcement cages have also been prefabricated in which the stirrups have been fixed in position by spot welds between the longitudinal and transverse rods.

One possibility of combining transverse reinforcement and reinforcement against deflection, while simultaneously improving the function of the reinforcement in the concrete structure, is to employ the welded lattice girders which have been patented for use in lightweight concrete (Swedish patent 7506173-9).

The present invention relates to a lattice girder which can be connected with prefabricated reinforcement units such as further lattice girders or welded mesh reinforcements, without using a tying wire, thereby to interconnet at the same time a large number of reinforcement rods in their correct position so that a coherent unit is formed. The separate reinforcement units extend in parallel with the longitudinal rods which they are intended to interconnect. The design of the individual reinforcement units facilitates such connection and renders it possible to transmit tensile stress in the finished structure.

The invention provides for considerable time saving in reinforcement work. Reinforcement cages can be manufactured in a fraction of the time required today for tying stirrups to longitudinal rods in conventional manner.

Compared to welding of the stirrups to the longitudinal rods, the connection according to the present invention can be made without large investments in welding equipment.

The connection is made by means of a lattice girder comprising three longitudinal steel rods and two zigzag wires, alternatively a lattice girder having two or four longitudinal wires and one zigzag wire which is

positioned on one side of the longitudinal wires, or two zigzag wires positioned each on one side of the longitudinal wires so as to be symmetrical for force-absorbing purposes. The lattice girder as described can be triangular in shape or extend in one plane.

The inventive lattice girder is characterised in that the zigzag wires interconnecting the longitudinal wires are formed as loops outside the longitudinal wires. The loops are cut open adjacent the longitudinal wires such that a transverse wire or rod can be inserted into the groove or be positioned in the loop by being turned.

The lattice girder is attached by means of the loops to welded mesh reinforcements of varying width and shape, or to further reinforcement girders such that the connection is triangular, square or rectangular in section. This design provides for a reinforcement which, in concrete structures, is capable of absorbing tensile stress in the concrete and which functions as an embracing reinforcement, the different members forming the connection in the structure. Consequently, large reinforcement structures can be produced with great accuracy and in a very short time. The reinforcement structure is rigid and can be transported as a unit, which facilitates handling on the building site. It is further capable of absorbing the torsional stress occurring in concrete structure elements when these elements are lifted or subjected to loads in the final structure.

The invention will now be described in greater detail below, reference being had to the accompanying drawing in which:

Fig. 1 is a perspective view of a lattice girder designed according to the present invention,

Fig. 2 illustrates schematically alternative embodiments of the lattice girder, and

Figs. 3-5 illustrate schematically various applications of the lattice girder according to the invention.

Fig. 1 is a perspective view of a lattice girder comprising three longitudinal wires 1 which are interconnected by means of zigzag wire stirrups 2 to form a lattice girder having a triangular section. The wire stirrups 2 extend slightly beyond the respective longitudinal wire 1, such that loops 3 are formed outside said wire. On one side, the loops 3 are cut open adjacent the longitudinal wire 1 so as to form a groove 4 into which a transverse wire 5 can be inserted. As shown in the lower left part of Fig. 1, the loops 3 of neighbouring stirrups can be cut open in parallel with each other or, as shown to the right, they can be oppositely cut open so that the transverse wire 5 can be inserted into the grooves 4 by being turned. The wire 5 may be a single wire interconnecting several lattice girders, or it can be a wire in a mesh reinforcement or some other prefabricated reinforcement unit.

Fig. 2 shows alternative embodiments of the lattice girder which may thus comprise two or four longitudinal wires 1 and a zigzag wire stirrup 2 extending on one side of the longitudinal wires 1, or between pairs of longitudinal wires, as shown in the upper part of Fig. 2, viz. to the left a cross-section of the lattice girder and to the right a side view thereof. The lower part of Fig. 2 illustrates a further variant of the lattice girder with two longitudinal wires 1 and wire stirrups 2 extending on both sides thereof, as shown to the left. The wire stirrup 2 can be arranged in parallel with each other, as shown in the lower center part of the Figure, or can be relatively offset, as shown in the lower right part of the Figure.

Figs. 3-5 show how a lattice girder according to one of the embodiments above can be used for reinforcing a structural member of concrete.

The lattice girders exemplified above can, of course, be modified in different ways. Thus, the wire stirrups may be extended to form loops merely on one side of

the lattice girder. Moreover, not all of the loops need be cut open to form grooves. The invention is therefore not limited to the embodiments described above and shown in the drawing, but can be modified within the scope of the appended claims.

CLAIMS

1. A lattice girder for reinforcing sandwich panels and like structures of concrete, comprising longitudinal wires (1) extending in parallel on different levels, and zigzag stirrups (2) interconnecting said longitudinal wires, c h a r a c t e r i s e d in that said wire stirrups (2) extend, at least on one side, beyond the respective longitudinal wire (1) so as to form loops (3) outside said wire, and that at least some of the loops (3) are cut open adjacent said longitudinal wire (1) to form grooves (4) into which transverse wires (5) are insertable to connect said lattice girder with other reinforcement units.

2. A lattice girder as claimed in claim 1, comprising two parallel wire stirrups (2) extending each on one side of said longitudinal wires (1), c h a r a c t e r - i s e d in that the loops (3) of said wire stirrups are cut open in parallel with each other such that said longitudinal wires (5) are insertable into said grooves (4) from one side.

3. A lattice girder as claimed in claim 1, comprising two parallel wire stirrups (2) extending each on one side of said longitudinal wires, c h a r a c t e r - i s e d in that the loops (3) of said wire stirrups are oppositely cut open so that said longitudinal wires (5) are insertable into the grooves by being turned.

4. A lattice girder as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that said wire stirrups (2) form loops (3) on both sides of said lattice girder.

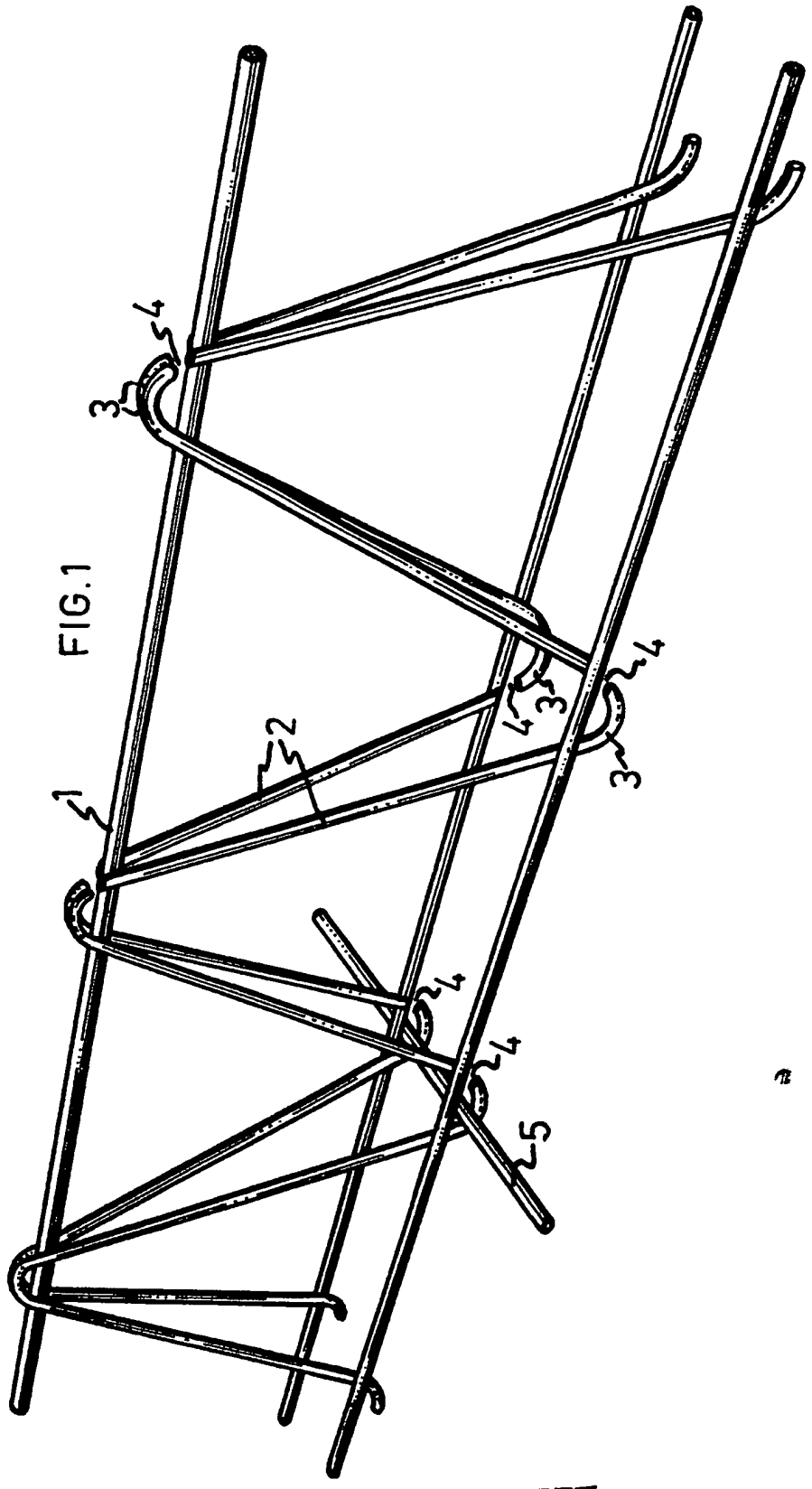


FIG.1

FIG.2

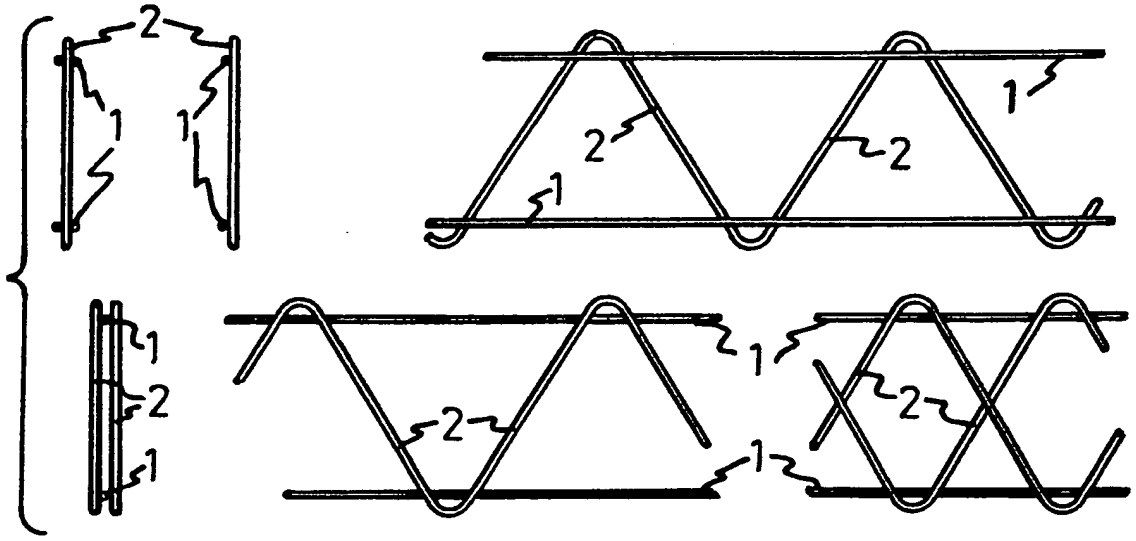


FIG.3

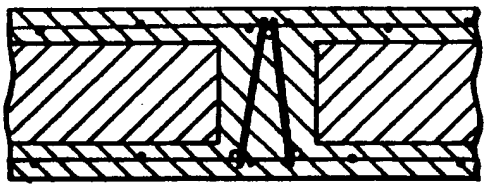


FIG.4

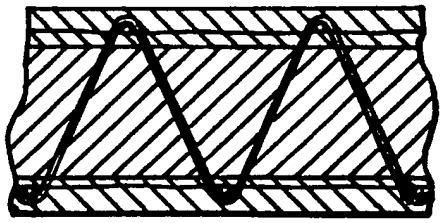
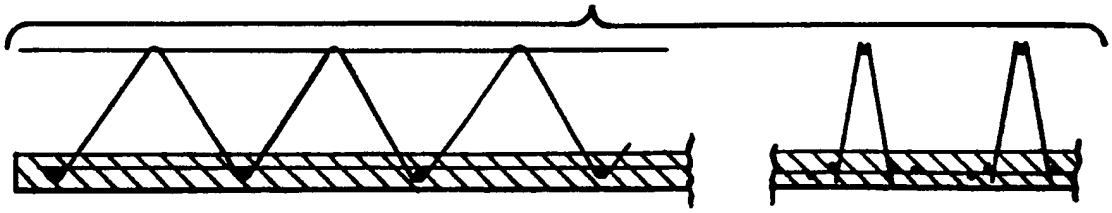


FIG.5



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00366

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

E 04 C 5/06

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	E 04 C
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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	AT, B, 293 697 (FILZMOSER, F) 25 October 1971	
X	DE, C, 200 025 (PIERSON, A S) 7 December 1905	1
X	DE, B, 1 269 324 (HASLINGER, W) 30 May 1968	1
X	DE, A, 2 034 034 (DAVUM) 4 March 1971 & NL, 7009209 FR, 2065639 CH, 516058 BE, 751638 OA, 3298	1
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
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International Searching Authority	**Signature of Authorized Officer**
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